

## T04D08 – SL Bonding Quiz

Name.....

1. Which compound has the least covalent character?
  - A.  $\text{SiO}_2$
  - B.  $\text{Na}_2\text{O}$
  - C.  $\text{MgCl}_2$
  - D.  $\text{CsF}$
2. Which statement is correct about **two** elements whose atoms form a covalent bond with each other?
  - A. The elements are metals.
  - B. The elements are non-metals.
  - C. The elements have very low electronegativity values.
  - D. The elements have very different electronegativity values.
3. In which substance is hydrogen bonding present?
  - A.  $\text{CH}_4$
  - B.  $\text{CH}_2\text{F}_2$
  - C.  $\text{CH}_3\text{CHO}$
  - D.  $\text{CH}_3\text{OH}$
4. Which substance has the lowest electrical conductivity?
  - A.  $\text{Cu(s)}$
  - B.  $\text{Hg(l)}$
  - C.  $\text{H}_2\text{(g)}$
  - D.  $\text{LiOH(aq)}$
5. Which molecule is non-polar?
  - A.  $\text{H}_2\text{CO}$
  - B.  $\text{SO}_3$
  - C.  $\text{NF}_3$
  - D.  $\text{CHCl}_3$
6. Which statement best describes the attraction present in metallic bonding?
  - A. the attraction between nuclei and electrons
  - B. the attraction between positive ions and electrons
  - C. the attraction between positive ions and negative ions
  - D. the attraction between protons and electrons
7. Which molecule is linear?
  - A.  $\text{SO}_2$
  - B.  $\text{CO}_2$
  - C.  $\text{H}_2\text{S}$
  - D.  $\text{Cl}_2\text{O}$
8. Why is the boiling point of  $\text{PH}_3$  lower than that of  $\text{NH}_3$ ?
  - A.  $\text{PH}_3$  is non-polar whereas  $\text{NH}_3$  is polar.
  - B.  $\text{PH}_3$  is not hydrogen bonded whereas  $\text{NH}_3$  is hydrogen bonded.
  - C. Van der Waals' forces are weaker in  $\text{PH}_3$  than in  $\text{NH}_3$ .
  - D. The molar mass of  $\text{PH}_3$  is greater than that of  $\text{NH}_3$ .
9. According to VSEPR theory, repulsion between electron pairs in a valence shell decreases in the order
  - A. lone pair-lone pair > lone pair-bond pair > bond pair-bond pair.
  - B. bond pair-bond pair > lone pair-bond pair > lone pair-lone pair.
  - C. lone pair-lone pair > bond pair-bond pair > bond pair-lone pair.
  - D. bond pair-bond pair > lone pair-lone pair > lone pair-bond pair.
10. Based on electronegativity values, which bond is the most polar?
  - A.  $\text{B—C}$
  - B.  $\text{C—O}$
  - C.  $\text{N—O}$
  - D.  $\text{O—F}$



11. Which of the following increase(s) for the bonding between carbon atoms in the sequence of molecules  $C_2H_4$  and  $C_2H_2$ ?

- I. Number of bonds
- II. Length of bonds
- III. Strength of bonding

- A. I only
  - B. I and III only
  - C. III only
  - D. I, II and III
12. Element  $X$  is in group 2, and element  $Y$  in group 7, of the periodic table. Which ions will be present in the compound formed when  $X$  and  $Y$  react together?

- A.  $X^+$  and  $Y^-$
- B.  $X^{2+}$  and  $Y^-$
- C.  $X^+$  and  $Y^{2-}$
- D.  $X^{2-}$  and  $Y^+$

13. Diamond, graphite and  $C_{60}$  fullerene are three allotropes of carbon.

(i) Describe the structure of each allotrope.

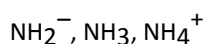
(3)

(ii) Compare the bonding in diamond and graphite.

(2)

(Total 5 marks)

14. Arrange the following in **decreasing** order of bond angle (largest one first), and explain your reasoning.



(Total 5 marks)

15. The elements sodium, aluminum, silicon, phosphorus and sulfur are in period 3 of the periodic table. Describe the metallic bonding present in aluminum and explain why aluminum has a higher melting point than sodium.

(Total 3 marks)



16. Draw a Lewis structure of a water molecule, name the shape of the molecule and state and explain why the bond angle is less than the bond angle in a tetrahedral molecule such as methane.

(Total 4 marks)

17. (a) An important compound of nitrogen is ammonia,  $\text{NH}_3$ . The chemistry of ammonia is influenced by its polarity and its ability to form hydrogen bonds. Polarity can be explained in terms of electronegativity.

(i) Explain the term *electronegativity*.

(2)

(ii) Draw a diagram to show hydrogen bonding between two molecules of  $\text{NH}_3$ .  
The diagram should include any dipoles and/or lone pairs of electrons

(3)

(iii) State the H–N–H bond angle in an ammonia molecule.

(1)

(iv) Explain why the ammonia molecule is polar.

(1)

- (b) Ammonia reacts with hydrogen ions forming ammonium ions,  $\text{NH}_4^+$ .

(i) State the H–N–H bond angle in an ammonium ion.

(1)

(ii) Explain why the H–N–H bond angle of  $\text{NH}_3$  is different from the H–N–H bond angle of  $\text{NH}_4^+$ ; referring to both species in your answer.

(3)

(Total 11 marks)



